

ANALYSIS OF THE SEDIMENT DATA FROM THE LOWER HACKENSACK RIVER

Filipiak, Karolina A.; **Johnson**, Ken; New Jersey Institute of Technology, Newark, NJ

The New Jersey Meadowlands Commission's Meadowlands Environmental Research Institute (MERI) has collected metals data in sediments from 24 sampling sites in the Lower Hackensack River estuary and its major tributaries during 1987-88 and 2003. During both of these time periods, data were collected on the following metals in the sediments: Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Nickel (Ni), Zinc (Zn). The 2003 study also included data on the following metals: Arsenic (As), Mercury (Hg), Iron (Fe) collected from 26 sampling locations with three replicates per each location with the total of 78 samples. Area subjected to observation is the river mile stretch between Newark Bay to the Bergen Turnpike and mouth of the Overpeck Creek in Ridgefield.

This paper describes the results of a comparison of the average levels of metals between the two time periods as well as the differences between different locations of the sampling sites. Since all sampling units were not uniform in volume, we normalized the units by using "percentage of fines in silt and clay" as the variable of interest. We also report the models fitted to describe each metal as a function of other metals for each of following 3 groupings: (i) overall, (ii) by part (river or tributary), (iii) by location (lower, middle, upper or tributary).

To test whether levels of metals were significantly different between studies done in 1987-88 and 2003 we have used paired t test. The justification for using the paired t experimental design is the methodology of having samples collected at approximately the same geographical locations where the only factor is the time in between collections. What is more, samples of metals in sediments were taken using 23cm x 23cm Ponar grab same for both studies. Paired t test was done in three levels of analysis. First we looked for the overall difference in concentration of metals in sediments for each of the metals. Second level of analysis grouped samples by allocation to the main river stream and tributaries. For the last level of analysis we sought for the difference in levels of metals when we grouped samples by location (lower, middle, upper and tributaries).

We have used general linear model to measure the relationship between each of the metals as independent or predictor variables and other metal as dependent or criterion variable. We have presented significant model equations for each of the metals. We found that there is a strong interaction between some of the elements.

In the last part of the analysis we have used analysis of variance (ANOVA) test with Tukey's pairwise comparison to look for the difference in concentration of metals in sediments between four locations for the data collected only in 2003. We wanted to analyze the average levels of Arsenic (As), Iron (Fe) and Mercury (Hg) relative to their position in the upper, middle and lower sections of the river.